

ΣΚΑΝΙΟΛΟΓΙΑ
Investment Advisory

Presented at
Seasonal Adjustment Practitioners Workshop
September 11-12, 2024

**Official Holiday Dates Are
Not Enough for Holiday
Adjustments**

Hideki Furuya

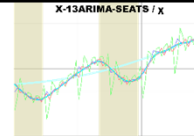
© 2024, ΣκάνιοΛογ Investment Advisory Co., Ltd.

X-13ARIMA-SEATS / X

Speaker icon

Official Holiday Dates Are Not Enough for Holiday Adjustments:

Our enhancement of X-13ARIMA-SEATS, has been targeting to detect most of the statistically significant holiday factors of the world. In our experiences, effects of moving holidays cannot fully measured by regressors of official holiday dates.



Hideki Furuya

Chief Operating Officer and Chief Economist, SKANIOGLOS Investment Advisory Company Limited[†]

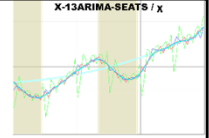
Certified Member Analyst of the Securities Analysts Association of Japan
Member of Pan Pacific Association of Input-Output Studies

[†]Registered Financial Instruments Business Operator in Tokyo, which provides macro-economics driven investment strategies on global securities/currencies portfolios.

<https://skanioglos.co.jp>



Hideki Furuya is Chief Operating Officer and Chief Economist of SKANIOGLOS Investment Advisory Company Limited. SKANIOGLOS Investment Advisory is a Registered Financial Instruments Business Operator in Tokyo, which provides macro economics driven investment strategies on global securities currencies portfolios.

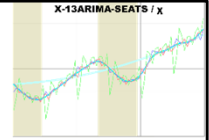


Kanto Local Finance Bureau No. 3059.
Member of Japan Investment Advisers Association, No. 012-02829.

Disclaimers

- This presentation is released to inform interested parties of research and to encourage discussion.
- This presentation is not released to recommend any investment action.
- The views expressed in this presentation are those of the author and not necessarily those of the SKANIIOGLOS Investment Advisory Co., Ltd.
- This presentation adopts software under development. Results of calculations may be different from those of the futures.

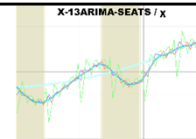
Disclaimers. This presentation is released to inform interested parties of research and to encourage discussion. And also, this presentation is not released to recommend any investment action.



By Kiefer, from Frankfurt, Germany - 08.Sep.2014, Mid-Autumn Festival. 15. Tag des 8. Mondmonats nach dem traditionellen chinesischen Kalender. Das Mondfest / Mitherbstfest, CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=38246745>



Mid Autumn Festival is coming. Next Tuesday, September 17th 2024. In the many of East-Asian Luni-solar calendars, fifteenth day of the eighth month is the day.

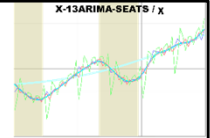


Mid Autumn Festival “Chuseok” of Korea has been expanded in 1989.

Lunisolar Calendar	08/10	08/11	08/12	08/13	08/14	08/15	08/16	08/17	08/18	08/19	08/20
1 day	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
	September										
	20	21	22	23	24	25	26	27	28	29	30
						Chuseok (weekend)	Substitution Holiday				
KOSPI	662.55	662.84	683.73	674.69	680.10	-	-	671.29	670.64	670.28	677.54
3 days	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue
	September										
	9	10	11	12	13	14	15	16	17	18	19
		weekend				Chuseok				weekend	
KOSPI	961.85	-	958.88	964.28	-	-	-	961.49	-	953.17	952.02

Sources:
Korea Composite Stock Price Index (KOSPI) : Korea Exchange. Inserted to indicate business days.
Lunisolar Calendar dates: calculated by SKANIUGLOS. Korean variant of East Asian Lunisolar Calendar.

Mid Autumn Festival is a moving holiday which falls on early September to early October of the Gregorian Calendar. Also, holiday dates may be changed over time. For example, Korean Mid Autumn Festival, “Chuseok” was one day holiday until 1988. From 1989, it has been expanded to three day holiday from the 14th to 16th of the 8th month.



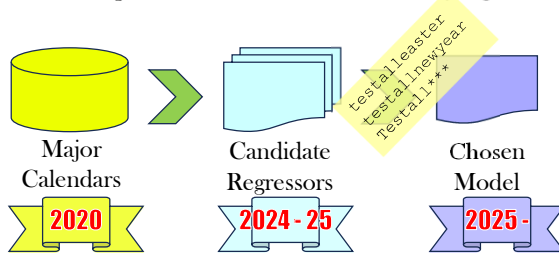
Holiday regressors — number of official holiday dates

Pros 😊: Easy to understand.

Cons ☹️:

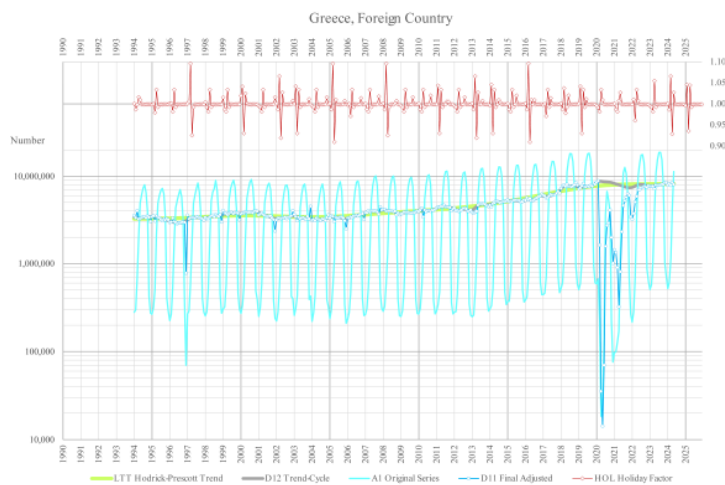
- 1 Sometimes statistically rejected.
- 2 Time consuming
— Imagine to collect laws and ordinances from dozens of countries.
- 3 Unknown holiday dates “of effects”
— Leads and lags for manufacturing, affected by day of weeks, affected by foreign holidays.

Basic design for **the detector** of holiday regressors



Once the holiday dates has been known, numbers of holiday dates can be used as holiday regressors. They are good regressors. They are easy to understand and often accepted for many series. However, one, because holiday effects includes both increase and decrease of production, one regressor models can be statistically rejected. Two, to collect laws and ordinances about holidays, which are often amended, is time consuming. Three, there are such unknown factors, that, leads and lags for manufacturing, day of week of holidays, foreign holidays which you are not familiar, and so on. Therefore, we hope to build in routines for detection of holiday regressors, including, lists or calculators of major calendars, generator of candidate regressors, and selector of model like test-all-easter in the original version. Calendars have been ready to build in since 2020. Generator of regressors is hopefully built in 2024 or early next year. Then model selection continues.

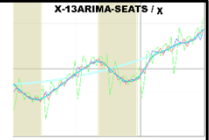
Holiday effects in tourism (1)



Source: EUROSTAT "Nights spent at tourist accommodation establishments - monthly data" [tour_occ_nim] as of 2024/08/01 23:00
 Classification of activities: Hotels and similar accommodation
 Country of residence: Foreign country and Domestic country
 Unit of measure: Number
 Source of working day variable: European Central Bank "Euro area and EU working days" as of 2022/06/28



As tests of regressor generator, some of holidays were tested for the European tourism data. This chart is for Greece, foreign country residents. From the original series, table LTT, trend, filtered by Hodrick-Prescott, table D-12, trend cycle series, table D-11, final adjusted series were taken, and table HOL, holiday factor was estimated.

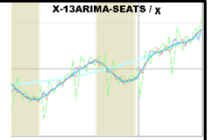


Holiday regressors:

1. **Carnival:** From Saturday, 50 days preceding to Easter
To Ash Wednesday, total 5 days
2. **Easter:** From Good Friday
To Easter Monday, 4 days.
3. **Pascha:** Easter of Eastern Christianity. Same 4 days as Easter.
4. **Eid ul-Fitr:** End of Ramadan festival. Umm-l-Qura calendar was applied.
From last day of Ramadan (at sunset, next month Shawwal begins)
To Saturday right after the third day of Shawwal, inclusive.
5. **Lunar New Year:** Chinese variant of East Asian lunisolar calendar was applied.
If New Year's eve is Friday or Saturday, from eve, else,
From the preceding Saturday of New Year's eve.
To next Sunday of New Year 3rd (inclusive), 9 or 10 days.



Five holiday regressors were calculated. One, Carnival, from Saturday, 50 days preceding to Easter to Ash Wednesday, total five days. Two, Easter, from Good Friday to Easter Monday, four days. Three, Pass ha, or Easter of Eastern Christianity, same four days as Easter. Four, Eid-al-Fitr, end of Ramadan festival. Common lunar calendar of Umm-al-Qura was applied. From last day of Ramadan to Saturday right after the third day of next month of Shawwal was chosen as regressor this time. Five, Lunar New Year of East Asian lunisolar calendar. 9 or 10 days from Friday or Saturday to Sunday including four days around New Year's day.



Country: 7 countries.

France, Germany, Greece, Italy, Spain, Switzerland, Türkiye

Span: 6 spans.

1. Jan 1990 to May 2024
2. Jan 1990 to Dec 2000
3. Jan 2000 to Dec 2010
4. Jan 2010 to Dec 2019
5. Jan 2020 to May 2024
6. Jan 2010 to May 2024

France: from Jan 1994, Greece: from Jan 1993,

Türkiye: only 1 span, from Jan 2013 to May 2023.

2020 to 2024 (almost midst of COVID) spans have no holiday factors but only outliers.

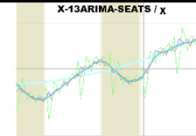
Resident: 3 series.

Domestic, Foreign, and Total.



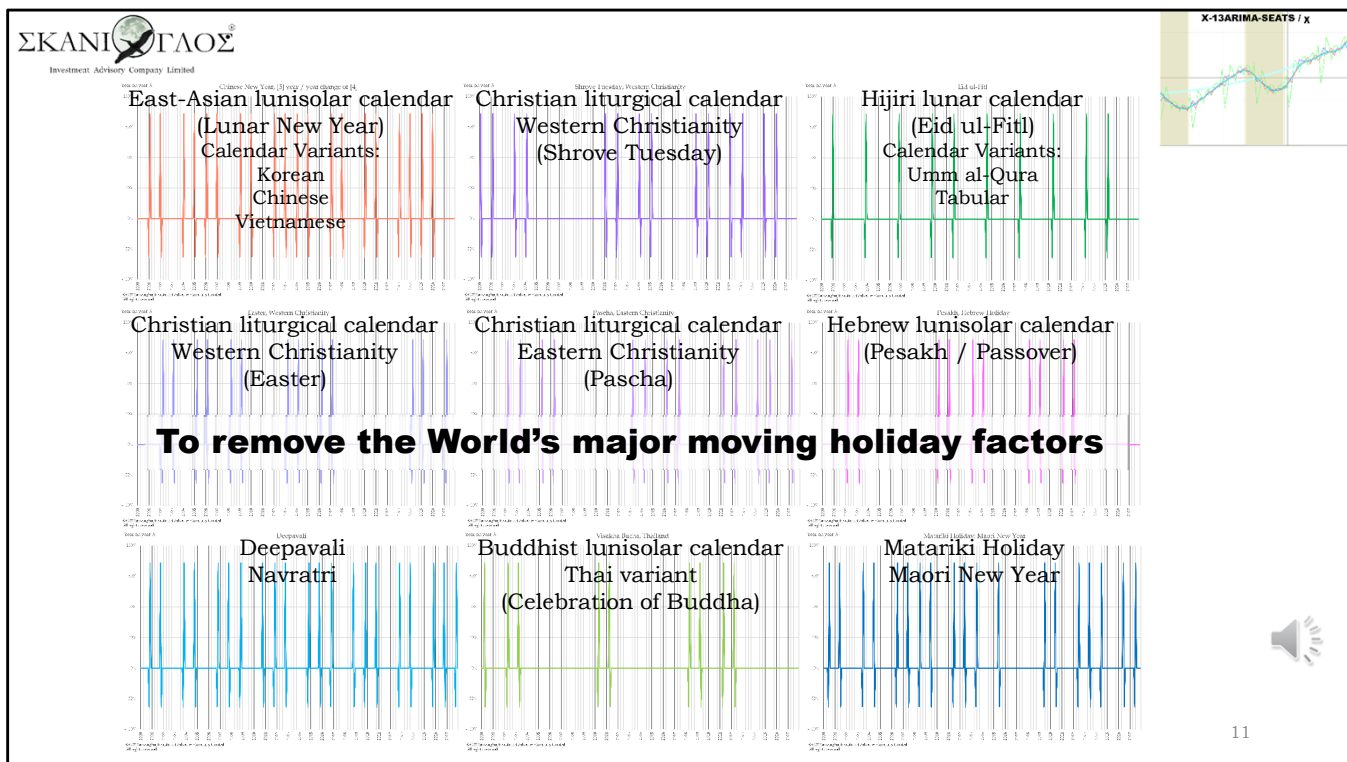
Regressions were for seven countries, France, Germany, Greece, Italy, Spain, Switzerland, and Türkiye. Spans are approximately each decades and through the series. Resident are 3 series, domestic, foreign, and total.

Holiday effects in tourism (4)

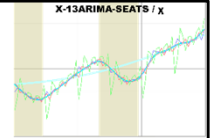


country	resident	span	acceptance	Holiday Variable	Parameter Estimate	Standard Error	t-value
country	resident	span	acceptance	χ2 test for	Degree of Freedom	χ2	p-value
Greece	foreign	1994-2024	accepted	Carnival	-0.010 765 903 793	0.002 404 068 169	-4.478
Greece	foreign	1994-2024	accepted	Easter	0.027 541 686 800	0.003 428 194 883	8.054
Greece	foreign	1994-2024	accepted	Pascha	0.008 630 305 728	0.003 774 721 288	2.286
Greece	foreign	1994-2024	accepted	Eid-ul-Fitr	0.002 086 558 293	0.001 572 982 359	1.326
Greece	foreign	1994-2024	accepted	Lunar New Year	-0.000 599 083 888	0.001 139 730 842	-0.536
Greece	foreign	1994-2024	accepted	All User-defined Holiday Regressors	5	0.139612508473450E+03	0.000000000000E+00
Greece	foreign	2000-2010	accepted	Carnival	-0.014 850 254 657	0.002 567 186 994	-5.783
Greece	foreign	2000-2010	accepted	Easter	0.028 474 227 054	0.003 671 719 981	7.728
Greece	foreign	2000-2010	accepted	Pascha	0.011 206 612 497	0.003 905 409 941	2.822
Greece	foreign	2000-2010	accepted	Eid-ul-Fitr	0.001 516 717 806	0.002 075 206 998	0.731
Greece	foreign	2000-2010	accepted	Lunar New Year	-0.000 602 796 575	0.001 050 552 093	-0.574
Greece	foreign	2000-2010	accepted	All User-defined Regressors	6	0.219984985173872E+03	0.000000000000E+00
Greece	foreign	2010-2019	accepted	Carnival	-0.012 983 867 343	0.002 460 519 605	-5.231
Greece	foreign	2010-2019	accepted	Easter	0.022 424 216 399	0.004 386 108 859	5.113
Greece	foreign	2010-2019	accepted	Pascha	0.016 834 388 122	0.004 526 420 604	3.719
Greece	foreign	2010-2019	accepted	Eid-ul-Fitr	0.001 215 692 169	0.002 192 632 533	0.554
Greece	foreign	2010-2019	accepted	Lunar New Year	0.002 321 643 439	0.001 497 851 035	1.550
Greece	foreign	2010-2019	accepted	All User-defined Holiday Regressors	4	0.12448821589635E+03	0.000000000000E+00
Greece	foreign	2010-2019	accepted	All User-defined Regressors	6	0.17200150043008E+03	0.000000000000E+00
Greece	domestic	2010-2019	accepted	Carnival	0.004 483 543 683	0.004 279 893 196	1.048
Greece	domestic	2010-2019	accepted	Easter	-0.009 351 913 221	0.007 230 527 358	-1.293
Greece	domestic	2010-2019	accepted	Pascha	0.036 607 361 983	0.007 590 146 747	4.823
Greece	domestic	2010-2019	accepted	Eid-ul-Fitr	-0.003 867 266 260	0.002 974 008 867	-1.301
Greece	domestic	2010-2019	accepted	Lunar New Year	-0.000 079 762 932	0.002 694 853 111	-0.030
Greece	domestic	2010-2019	accepted	All User-defined Holiday Regressors	5	0.278169891000070E+02	0.395228183120400E-04
Greece	domestic	2010-2019	accepted	All User-defined Regressors	6	0.379733664127373E+02	0.113690857168663E-05
France	foreign	1993-2000	accepted	Easter	-0.000 067 576 599	0.001 298 753 244	-0.247
France	foreign	1993-2000	accepted	All User-defined Regressors	2	0.197047170782729E+01	0.3733511602201E+00
France	foreign	2000-2010	accepted	Carnival	0.008 353 017 200	0.003 189 325 392	2.614
France	foreign	2000-2010	accepted	Easter	0.026 304 821 756	0.004 143 911 225	6.376
France	foreign	2000-2010	accepted	Pascha	0.001 650 746 817	0.005 085 851 373	0.323
France	foreign	2000-2010	accepted	Eid-ul-Fitr	0.000 588 012 771	0.001 464 582 820	0.401
France	foreign	2000-2010	accepted	Lunar New Year	0.000 267 729 151	0.001 415 874 187	0.189
France	foreign	2000-2010	accepted	All User-defined Holiday Regressors	4	0.10384480850049E+03	0.000000000000E+00
France	foreign	2000-2010	accepted	All User-defined Regressors	6	0.148306654384608E+03	0.000000000000E+00
France	foreign	2010-2019	accepted	Easter	0.000 352 883 360	0.000 892 811 557	-0.395
France	foreign	2010-2019	accepted	All User-defined Regressors	2	0.187078786443829E+01	0.392431243767552E+00
France	domestic	2000-2010	accepted	Eid-ul-Fitr	0.000 121 408 465	0.000 434 226 713	0.280
France	domestic	2000-2010	accepted	All User-defined Regressors	2	0.146421477094795E+00	0.929404947937892E+00

This is part of statistically accepted holiday parameters for, Greece and France. For Greece, foreign residents seems to be affected by the above holidays for the span of 1994 to 2024, and from 2000 to 2019. Of which Carnival has minus parameters with strong t-values, suggesting not the season to go to Greece. For domestic residents of Greece, Pascha seems to be the season for domestic tours. For France, foreign residents seems to be affected by above holidays for the span from 2000 to 2010. Of which, Carnival and Easter had strong t-values. Is France a competitor of Greece during Carnival? These are part of experiments to examine procedures of model selection. And many other holidays to be built in.



Data of the following calendars and holidays have been prepared to build in X-13ARIMA-SEATS. Very roughly from east to west; Matariki Holiday of Maori New Year: Korean, Chinese, and Vietnamese variants of East Asian lunisolar calendars: Thai variant of Buddhist calendar: Deepavali and other holidays of Hindu calendar: Hijiri lunar calendar: Hebrew lunisolar calendar: Liturgical calendars of Eastern and Western Christianity. We sincerely hope to develop a software which can semi-automatically detect the world's major moving holiday factors soon.



References and links (1)

Softwares:

Main part

Census Bureau, USA, X-13ARIMA-SEATS Seasonal Adjustment Program <https://www.census.gov/data/software/x13as.X-13ARIMA-SEATS.html>.

Additional

SUGA, Takashi "When_exe - A multicultural and multilingualized calendar library" Gems for Ruby are here https://github.com/suchowan/when_exe. Usages can be seen on <http://hosi.org/>. When_exe aims to express and convert the calendar used in all cultures and languages of all ages. This aim kicked off my plan to include almost all the world's statistically significant calendars.

Articles:

Anirban Sanyal, Pratik Mitra, Tucker S. McElroy, and Anindya Roy, August 2017, "Holiday Effects in Indian Manufacturing Series", <https://www.census.gov/library/working-papers/2017/adrm/rrs2017-04.html>.

Australian Bureau of Statistics, November 2005, "Estimating and Removing the Effects of Chinese New Year and Ramadan to Improve the Seasonal Adjustment Process" <https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1350.0Technical%20Note1Nov%202005?OpenDocument>.

Furuya, Hideki, August 2002, "Chinese New Year Effects Estimated by X-12-ARIMA" https://www.jcer.or.jp/report/research_paper/detail3606.html, sorry written in Japanese and no translations, and pdf here is members only. Draft in Japanese is available.

Lin, Jin-Lung and Liu, Tian-Syh July 2002, "Modeling Lunar Calendar Holiday Effects in Taiwan" <https://www.census.gov/library/working-papers/2002/adrm/lin-01.html>.

Matariki Advisory Committee, New Zealand, May 2021, "Matariki Dates 2022 - 2052" <https://www.mbie.govt.nz/assets/matariki-dates-2022-to-2052-matariki-advisory-group.pdf>

Yap, Bee Wah, Norhayati Shuja', and Mohd Alias Lazim, 2007, "Moving Holiday Effects Adjustment for Malaysian Economic Time Series", https://www.academia.edu/20549481/Moving_Holiday_Effects_Adjustment_for_Malaysian_Economic_Time_Series.

Formulae:

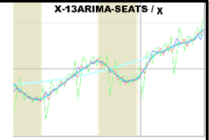
Christian liturgical calendars:

Western https://en.wikipedia.org/wiki/Date_of_Easter#Anonymous_Gregorian_algorithm

Eastern https://en.wikipedia.org/wiki/Date_of_Easter#Mecus's_Julian_algorithm

Thai traditional Songkran: <https://th.wikipedia.org/wiki/สงกรานต์>. English wiki seems strange.

Links to articles, formulae,



References and links (2)

Sites:

Hindu festivals: <https://www.drikpanchang.com/>. Among the panchang sites, span of this site is extremely long.

The author is thankful that this site allowed to retrieve very many times as a free user.

{1001 years from 1600 to 2600 + (10 year backcast span + 10 year forecast span) + (maximum 1 year lead + maximum 1 year lag) × 6 cities × 4 holidays = 28,872. At least, 28,872 times.

The Gregorian Calendar was introduced to set proper dates of Easter (*ad rectam Paschalis festi*). In the today's title "Inter Gravissimas", Pope Gregory XIII stated as three appropriate that

- first, correct placement of the vernal equinox; **The first condition is, March equinox to fall around March 21st.**
- next, correct placement of the fourteenth day of the moon in the first month, which [fourteenth day] either occurs on the day of the equinox itself or is the next to follow after;
- and lastly, the first Sunday which follows that same fourteenth day of the moon.

Photocopy of *Clavius, Christoph, Romani Calendarii A Gregorio XIII. P. M. restituti explicatio S. D. N. Clementis VIII. P. M. Ivssv edita : accedit confutatio eorum, qui Calendarium aliter instaurandum esse contenderunt, 1603*

was taken from <https://echo.mpiwg-berlin.mpg.de/ECHOdokuView?pn=53&ws=3&url=/mpiwg/online/permanent/library/YXK9FE9W/pageimg&start=51&viewMode=images&mode=imagepath>, and English translation taken from https://en.wikipedia.org/wiki/Inter_gravissimas.

Euro area and EU working days to build Calendar Adjustment Regressor

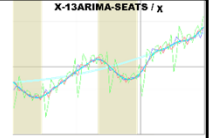
https://ec.europa.eu/eurostat/cros/content/euro-area-and-eu-working-days-build-calendar-adjustment-regressor_en

Archived site

https://cros-legacy.ec.europa.eu/content/euro-area-and-eu-working-days-build-calendar-adjustment-regressor_en



And more information



References and links (3)

Further references:

Pew Research Center

The Future of World Religions: Population Growth Projections, 2010-2050

<https://www.pewresearch.org/religion/2015/04/02/religious-projections-2010-2050/>

Comment by HF – many holidays are related to religions % of global population: Christians and Muslims 30% each, Hindus 15%, Buddhists 5%, and so on.

“Umm al Qura” is a variant of Hijili Lunar calendar which seems to be broadly adopted (still checking)

R.H. van Gent, “The Umm al-Qura Calendar of Saudi Arabia”

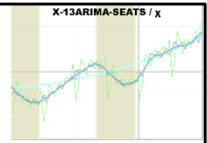
<https://webpace.science.uu.nl/~gent0113/islam/ummalqura.htm>

Umm al Qura calendar site

<https://ummulqura.org.sa/default.aspx>



Further references



Thank you for viewing.

<https://skanioglos.co.jp>

hidekifuruya@skanioglos.co.jp

Thank you for viewing this slide.

Inquiries, suggestions, or questions are welcome (^_^)!